The Tectonic Strain Theory of Luminosities (UFO Reports)

by M. A. Persinger, Ph.D.

Abstract

►Numbers of UFO reports (UFORs) frequently increase weeks to months before seismic events. These observations are commensurate with the explanation that most UFO phenomena are associated with tectonic strain within the earth's crust. Data from the Center for UFO Studies and from Fate magazine were examined through 1-, 3-, 6-, 12-, and 24-month time frames within different-size spatial windows. Temporal analyses employing six-month increments within relatively large but homogeneous tectonic regions optimally demonstrated the relationship between UFORs and consequent seismic activity. In the central U.S.A., UFORs tended to increase during the six-month increment just before an increase in V or less intensity earth tremors and to increase after very large quakes. A percentage change in the number of low intensity quakes was preceded by a comparable percentage change in UFORs. All major types of UFORs correlated with the optimal seismic measures; only the strangest type of reports were not significantly related. The space-time scales at which the phenomenon is most apparent strongly suggests the central role of some fundamental geophysical process.

Introduction

LUMINOUS, spherical displays with mean durations of about 10 minutes and spatial volumes in the order of 10 to 100 cubic meters have been frequently reported for hundreds of years. As social beliefs and cultural explanations changed, the names of these odd luminosities altered as well. During the eighteenth century, these peculiar lights were attributed to spiritual sources; during the nineteenth century secular labels, such as "odd luminosity," "airship," or "peculiar meteor train," were applied. More recent nomenclature such as UFOs, extraterrestrial crafts, or celestial guardians has reflected the interest in space research and substitution of traditional religious beliefs.

Explanations for UFO-related luminosities have been almost as numerous as the number of observations. Like the labels used in previous times, the explanations often reflect the fads and fallacies of a particular generation. To date only one theory has been developed that can (a) generate testable hypotheses, (b) be verified (or refuted) with available data, and (c) be used to *predict* the occurrence of UFO reports. As a reflection of the central process involved, it is called the *tectonic strain theory* of UFOs. [1,2,3]

Recent analyses employing extrapolations[4] from this theory have elucidated several interesting properties of UFO-related luminosities. Discriminant functions that accurately classified 95% of the cases Charles Fort reported as "odd luminosities" within European space between the years 1850 to 1900 accurately predicted *all* of the UFO flap periods between the years 1950 to 1980. In addition, these functions indicated that UFO-like reports *should* have occurred during the intervening decades. During these decades, there were no reports of UFOs and spaceships. There were reports, however, of mysterious airplanes, foo-fighters, and ghost rockets.

When applied to the U.S.A., the tectonic strain model has been equally illuminating. Multiple regression equations derived from UFO reports collected during the years 1950 to 1975 and applied to the years 1820 to 1949, accurately predict the famous 1947 flap. Interestingly, these equations also predict that an unprecedented flap should have occurred during the first half of the year 1897. Like the European data, these analyses also indicate that UFO-like flaps should have been present during the 1920s and 1930s. UFOs were not reported; odd airships and disappearing airplanes were often epidemic.

The central theme of this concept is that most (but not all) UFO-related luminosities are associated with tectonic strain within the earth's crust. As the strain accumulates locally, the likelihood of UFO phenomena being generated in the vicinity increases dramatically. The specific locus of UFO occurrences reflects the local spaces traditionally associated with strain accumulation (and release). Fault lines or fracture zones are obvious examples.

Tectonic strain in this context is a *hypothetical construct*. Although most geophysicists would accept the explanation that strain exists within the earth's crust, the existence of strain is inferred from distortions in surface topography, time-related, increased ellipsticity of round

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holes bored into rock beds, or rock bursts. Most of all, strain is inferred by the occurrence of earthquakes.

Tests of the tectonic strain theory of UFO-related luminosities have involved the most observable correlate of strain: earthquakes. Occurrences of earthquakes within an area indicate that strain has existed and hence the conditions for generating UFO-like luminosities have occurred. The theory does *not* state that UFOs cause earthquakes or earthquakes cause UFOs. Instead, the theory states that a third factor, *tectonic strain*, produces both UFOs and earthquakes.

The formal description of the tectonic strain theory is important at this point in the history of UFO research for two reasons. First, it has been frequently misconstrued by popular writers. Many journalists have assumed that UFOs occur only at the times of earthquakes. Consequently, UFOs occurring before or after earthquakes are not explained by the model. This interpretation is not correct.

Secondly, understanding the formal definition of theory allows one to apply it accurately. If UFOs are assumed to be associated with tectonic strain, then most UFOs should occur *before* earthquakes. An earthquake only verifies that stress and strain have been present. Since a specific area is prone to particular *patterns* of seismic activity, they could be used to infer which strain conditions are optimal to produce UFO displays.

Ultimately, the precision of the tectonic strain theory for predicting UFO events must be determined by the technology and methodology of the most relevant discipline, in this case geophysics. However, the first-order operations to determine the basic characteristics of a phenomenon are the same in all of the sciences. To solve a problem, the frontier researcher must know the optimal temporal and spatial windows in which to see it. Once established, the internal consistency of predictions generated from the theory and its reliable application in different situations can be evaluated.

Methods

Fine resolution of any phenomenon is limited by the measurement procedure and apparatus. Elementary positivism dictates that scientists do not directly study principles or operations. Instead, scientists really measure changes in instruments. We assume these changes accurately represent some fundamental and persistent process.

We do *not* directly measure UFO-related luminosities. Although most of us would agree that UFOs appear to share common characteristics throughout space and time, we have not measured the central processes. Instead, we have recorded what people *say* about UFO events; they are presumed to have occurred. In short, we do not measure UFOs, we record UFO *reports* (UFORs).

All scientific disciplines, from astronomy to zoology, have invested significant portions of their resources towards the determination of the *validity* and the *reliability* of central measurement procedures. Evaluations of validity are required to determine if the scientist is measuring what he or she is supposed (usually on the basis of some theory or assumption) to be measuring. Reliability is an indicator of the similarity of several repeated measurements in the same situation.

Few studies have addressed this problem in UFO research. UFORs are often assumed to be totally valid and reliable. If a person or group of people say they saw a round disc with portholes, many researchers assume the event (as described) actually occurred. If one researcher finds that there was a 100% increase in the number of UFORs in his sample, other researchers assume that this increase would have occurred if they had sampled as well. The many complex social-psychological and statistical processes that contribute to the UFOR measurement (what people report) are ignored.

Before the technology of modern geophysics can be applied to UFO phenomena, the problems of validity and reliability of measurement will have to be carefully considered. There is, however, a more fundamental presumption that must be recognized first. If the contributing variables to UFORs are considered to be more or less consistent, how well do they reflect the number of UFO *events*?

This question must be answered to determine the inherent error in the "measurement apparatus," in this instance, the human species. If each portion of the earth's surface was viewed by a human being, twenty-four hours of every day, then we could conclude that the total sample of UFORs closely approximates the total number of UFO events. (We still would not know any more about the validity of those reports, unless we had some other instrumentation, such as video recorders obtaining information simultaneously.)

If we assume that UFORs are only a sample of the total UFO events that have occurred during a particular time and in a specific space, then we can begin to analyze the UFO characteristics by determining the *relative* variation in different samples. Whereas one sample of UFORs with a baseline of let's say 1000 records per month may suddenly increase to 5000 reports, a second sample with a baseline of 10 reports may increase to 50 reports. Although the absolute number is different (and may reflect the number of operators in the field organization), the relative changes would be compatible.

To test this reliability across data samples, UFORs from two separate pools were obtained. The first pool was from CUFOs (Center for UFO Studies) in Illinois. The monthly totals of various UFOR types were obtained on computer tape for the years 1950 to 1970. The second pool was obtained from the reports published in FATE magazine. These reports had been placed on the master data file involved with previous studies and only required a sort program.

All analyses were completed with SPSS software on a Dec 2020 System computer. Since this report is concerned with the UFO phenomena and not statistical methods, specific procedures for determining distribution properties (means, skewness, measures of variance) will not be discussed in detail. However, they cannot be ignored in this research.

The CUFOS pool contained about 100 times the number of reports contained within the FATE sample. Between the years 1950 and 1970, for example, the number of total UFORs within the central U.S.A. from the CUFOS pool was about 8,000. A total of 80 reports were sorted from the FATE sample for this period.

CUFOS data are coded according to one of nine different types of UFO reports that reflect increasing properties of strangeness. A total of 2,200 of the reports were

specifically classified. The major portion of the reports for this region, about 70% of them, were left in the non-classified category. The correlation between each type of UFOR and the non-classified types with the total number of UFORs reflected the numerical weighting of the sample. For example, the non-classified cases, which characterized most of the reports were correlated 0.70 with the total sample. Only types VIII and IX were not significantly correlated with the main pool.

The FATE sample did not contain elaborate internal differentiations. In our original classification scheme, we allocated six categories of UFO types, similar in concept to the CUFOS file. However, the numbers of UFORs not classified in the main "general" UFO category were so small that they were not used in this analysis. The problems and limitations of this procedure have been discussed elsewhere.[5,6]

Correlation analyses between UFORs per six-month increment (January-June; July-December) for each year between 1950 and 1970 for the FATE data and similar data-arrays from the CUFOS sample, demonstrated coefficients between +0.40 and +0.70. All combined classifications within the CUFOS sample correlated about +0.45 with "general" UFORs within the FATE data. On the other hand, Type III and IV reports within the CUFOS sample correlated +0.65 with the FATE data. These types of UFORs involve "odd luminosities moving with peculiar trajectories," the kind most frequently reported in FATE as UFO events.

Numbers of reports can be influenced by multiple measures of the "same" event or by clusters of UFO events related to the "same" process. Thus if a flurry of UFO events occurred during a short period (a month) within a populated region, UFORs could be escalated significantly. Many of these UFORs would be in essence repeated measures of the same phenomenon. In this instance, simple totals of UFORs would not be reliable measures of UFO phenomena over time.

One way to attenuate this effect is to derive "flap scores" for each increment. Instead of dealing with actual numbers of reports, either a 0, 1 or 2 is considered. A "0" refers to a low frequency period (even though there may still be a constant stream of UFORs), while a "1" refers to a typical flap period. A "2" designation is reserved for extraordinary flap periods. During 20 years within the central U.S.A., for example, there have only been about 4 or 5 (about 10% of the time) superflap increments.

Correlations of flap scores between the FATE and CUFOs data were much higher. Flap scores for Type III and IV UFORs from the CUFOS sample correlated 0.80 with the flap scores for total UFORs within the FATE sample. The major discrepancy between the FATE and CUFOS data occurred for the years 1966 to 1968. Before and after this period, flap evaluations are remarkably similar.

In general, we can conclude that some sytematic response is being recorded. Two separate data samples, one based upon written correspondence and field investigations and the second based upon newspaper reports and personal interviews, demonstrated more or less similar fluctuations over time. The question of validity has not been answered. For now, we will assume that the number of UFORs are systematically related to the number of UFO events.

Measurements

Sometimes a phenomenon can be overlooked if the measurement is too crude or inappropriate. Total numbers of UFORs per unit time is the simplest form of

measurement. With this procedure, the total numbers of UFORs, regardless of category or classification, are correlated with the total number of appropriate seismic measures. Figure 1 contains a scattergram of the relationship between UFORs and V or less intensity (Modified Mercalli) quakes within the central portion of the U.S.A.

The correlation coefficient for this relationship is +0.70. Stated alternatively, about 50% of the variance in UFORs can be accounted for by knowing the seismic activity (or vice versa). Note the existence of the outlier. This single point, when 25 quakes were associated with 850 UFO reports, has the potential to distort the relationship. In this instance, however, the removal of this single point does not appreciably lower the correlation coefficient.

One way to attenuate the effects of "outliers" and the existence of skewness within a data sample is to calculate square root values. Most of my analyses include square root values of UFORs and earthquakes as well as the absolute data. Calculation of square root values preferentially attenuates the larger (outlier) values. Since they often reflect non-linear processes and most statistical models are based upon linear assumptions, square root operations frequently reduce error measurements.

A non-linear process is something that may not be involved with the same source of variance as the other points. For example, a large outlier may reflect another phenomenon altogether. One candidate that may contribute to the inflation of UFORs, especially during flap periods, has been social facilitation. It is manifested in non-systematic, excessive media coverage or social climate. Both contribute to "band wagon" effects.

Another measurement problem that has entered in UFO research is the change in collection criteria or data source. Whereas the FATE source has been subject to more or less the consistent selection criteria of the editors, the massive CUFOS data sources have changed. A large portion of the data before 1965 was derived from *Project Blue Book* or related sources. Data after this period involve inputs from correspondence and specific field groups. The sudden shift is clearly evident when the cumulative record of the number of UFORs is graphed as a function of years (Figure 2).

These problems plague more than just the larger organizations like CUFOS. As interest changes and specific field researchers join or resign from field committees, the absolute number of UFORs recorded may change dramatically. In addition, there is "habituation variance." A mediocre UFOR may receive excessive coverage following a paucity of reports while a very important UFOR may be ignored if it is occurring during a large flap period.

One interesting trend in many UFO organizations, even in Fort's collection period, is the gradual and continuous increase over time in UFOR numbers as the key investigators become more organized or more selective in their interests. Often this increased slope of UFORs over time is misconstrued to represent an increase in UFO

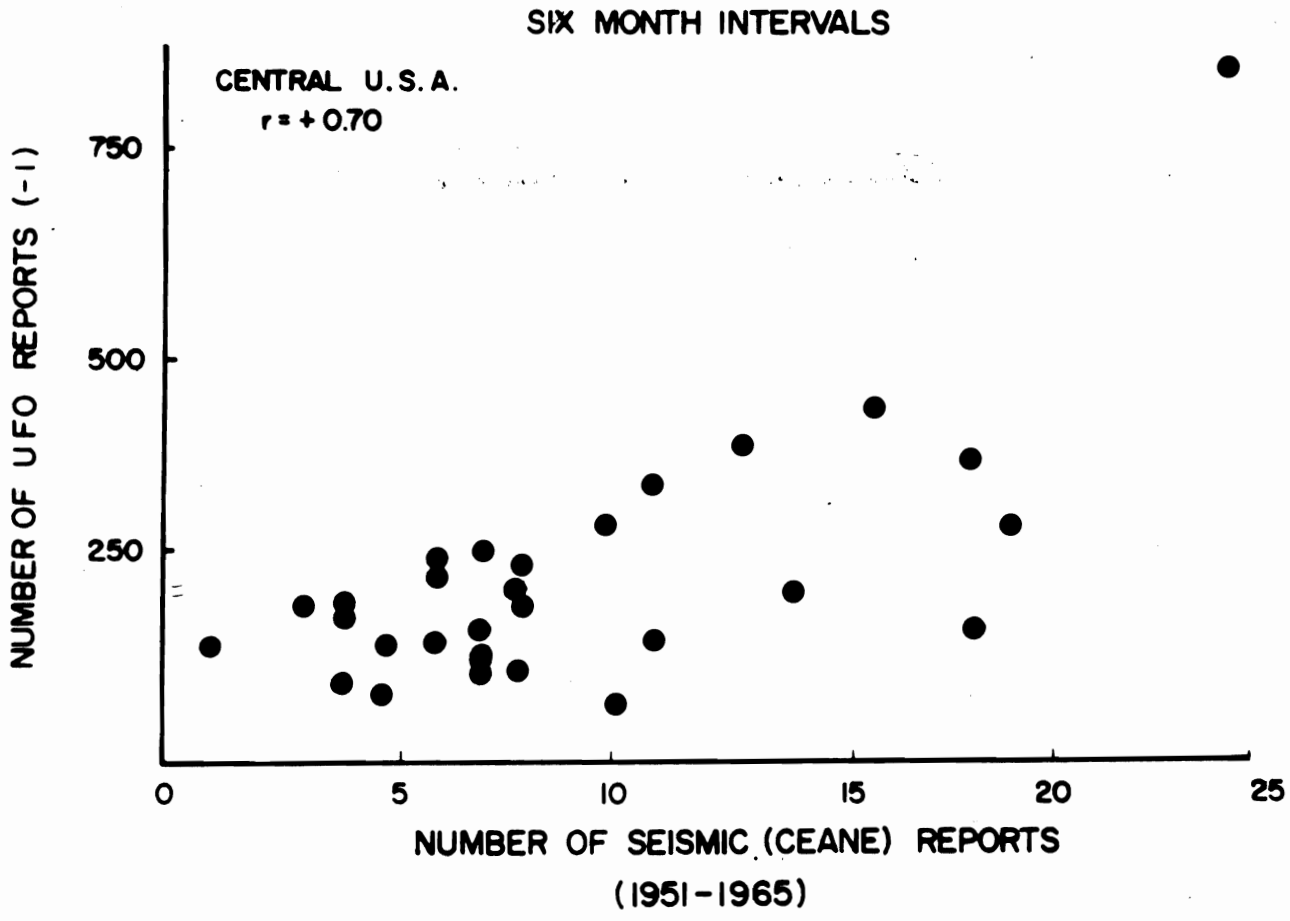

Figure 1. Scattergram of the numbers of V or less intensity (Modified Mercalli) earthquakes within the central, northeastern and eastern regions (CEANE) of the U.S.A. and the total number of UFORs (from CUFOS) in the central U.S.A. during the previous six-month interval (-1) for the years 1951 to 1965.

'Precise elucidation of the controlling variables of UFO phenomena should not detract from the mystery of Fortean events. Indeed, it increases the appeal even more. For now we know there is an empirical handle by which we can open the door to even more profound discoveries.'

phenomena when actually it simply reflects artifacts of sampling procedures. The actual numbers of UFORs may not have changed if the data sampling procedures had been kept constant.

One way to attenuate this problem is to use measures of *percentage change* over time. With this method, a given increment of analysis is used, let's say, six months. For demonstration, a six-month increment was selected that involved the total number of UFORs during January to June and July to December of every year in the data sample. To calculate percentage change over time (a routine procedure with SPSS software), the numbers of UFORs in a given increment is subtracted from the numbers of UFORs in the previous increment. The difference is then divided by the total number of UFORs in the previous increment and multiplied by 100.

The measurement is called percentage change and indicates the relative alteration with respect to the previous increment. A major advantage of this measurement is that abrupt shifts in data sample numbers do not adversely affect it. Suppose, during a period when a UFO organization was beginning, two adjacent increments shifted from 20 to 200 UFORs during the six-month increment before an increase in earth tremor activity. A few years later, after the organization had gained broader data coverage, two adjacent increments shifted from 200 to 2000 UFORs before the *same type* of increased earth tremor activity. Ordinary correlation analyses with absolute values would not detect the UFOR-tectonic relationship.

However, the percentage change in UFOR measures would clearly show the tectonic effect because the relative change within the data samples would be the same for the same number of earth tremors. The only major deviation from the pattern would occur at those key interface years (increments) when the small data samples merge with the larger data samples. This would be seen in a cumulative record of UFORs as a sudden jump and maintained change in the baseline.

In the CUFOS data file, a sudden jump in the numbers of UFORs occurred after the year 1965. After that year, the strong correlations between UFORs and earthquake numbers dropped precipitously (shown in Figure 2). Even

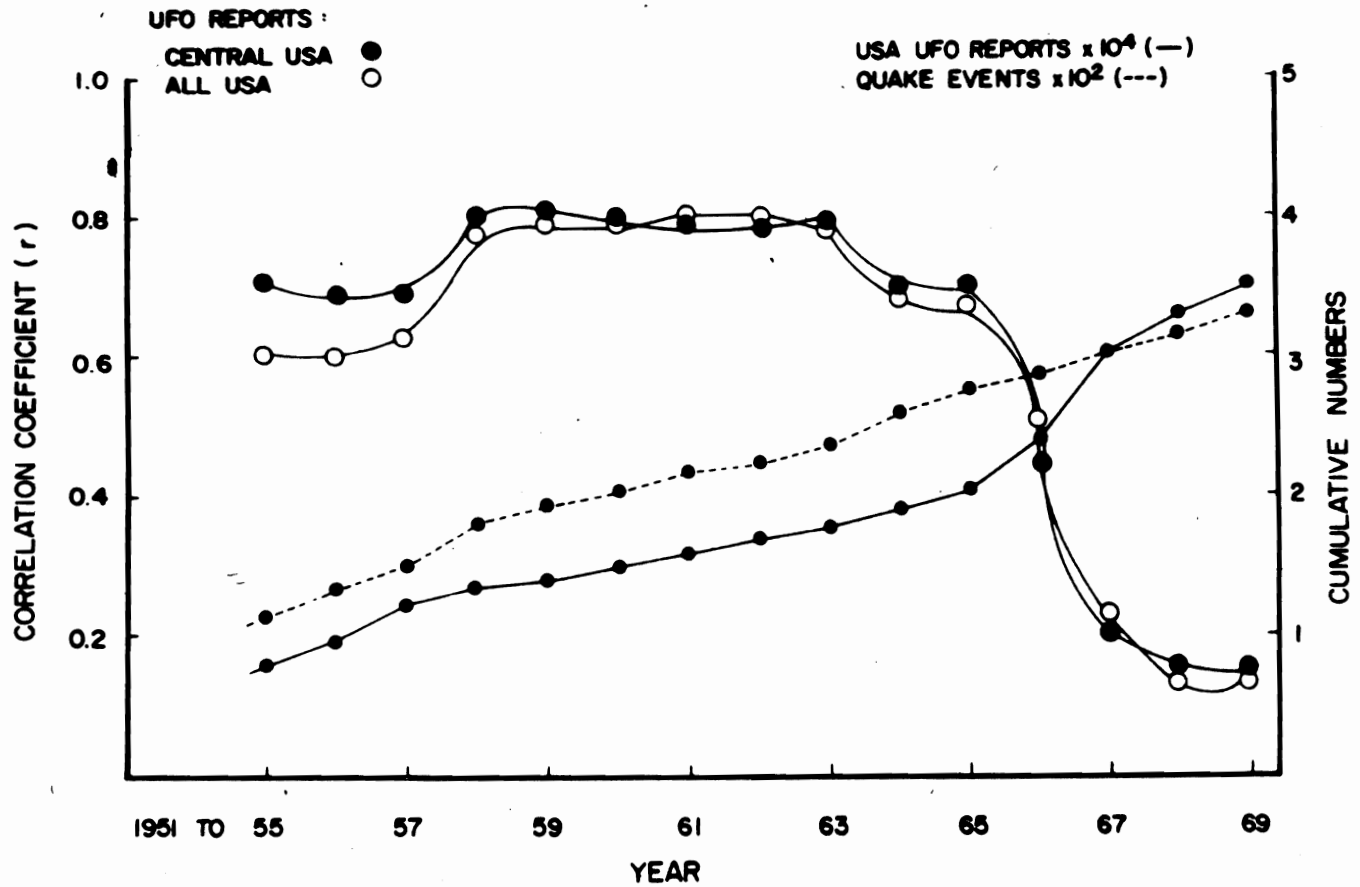

Figure 2. Correlation coefficients between numbers of low intensity tremors and UFORs during the previous six-month period as a function of years. The solid line (small closed circles) refers to the cumulative numbers of UFORs throughout the U.S.A. from the UFOCAT file while the broken line (small closed circles) refers to the cumulative numbers of low intensity quakes within the central U.S.A.

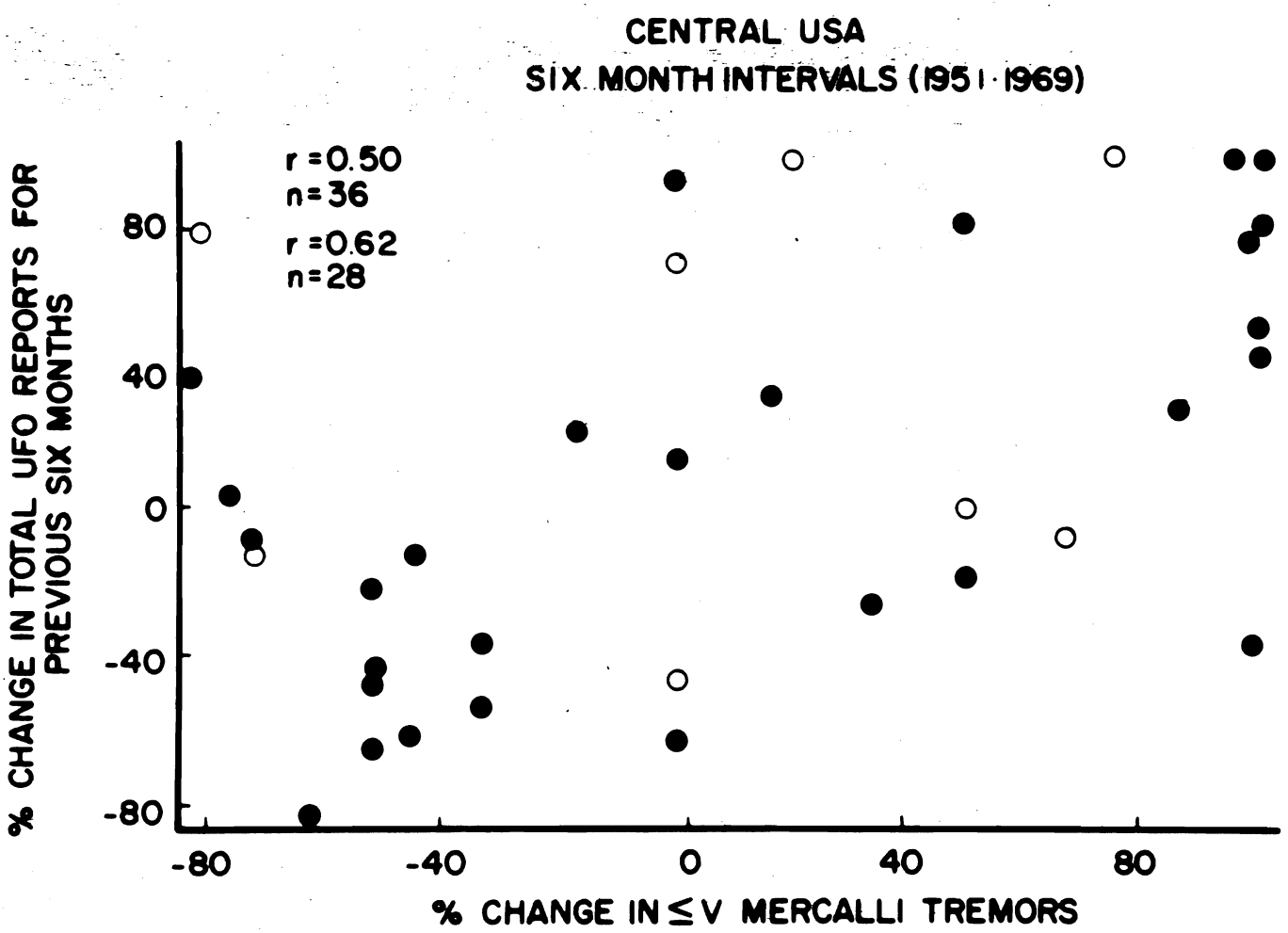

Figure 3. Scattergram of the percentage change in numbers of V or less intensity earthquakes within the central U.S.A. and the percentage change in total UFORs during the previous six-month periods for that region. Open circles refer to increments after 1965. Two r values are shown, one for the years 1951 to 1965 (n = 28) and one for the years 1951 to 1969 (n = 36).

Charts and tables for this article and map on facing page were prepared by the author.

with the use of square root values, the large jump in the numbers of UFORs recorded by that organization masks the effects. On the other hand, the FATE sample demonstrated the same intensity of relationship between UFORs and seismic activity, regardless of the period.

The usefulness of the percentage change measures (for both UFORs and numbers of earth tremors) can be seen in Figures 3 and 4. In Figure 3, the percentage changes in UFORs from the previous temporal increment (in this case six months) were correlated with the percentage changes in the numbers of appropriate seismic events. As can be seen, regardless of the change in absolute numbers of UFORs in CUFOS data, the relationship with seismic measures is still clear. The open circles indicate the years suspected of being interfaces with changes in data sampling or source procedures (i.e., after 1965).

Figure 4 indicates that the effect is evident even when specific types of UFORs are considered. It demonstrates that Type III and IV UFORs, specifically, are positively and systematically correlated with percentage change in seismic activity. Type III and IV UFORs appear to be modern examples of the classic luminosity reports mentioned by Charles Fort.

The major disadvantage of this measure is that it reflects *only* relative changes from the previous increments. If a UFOR flap was maintained for several successive (six months) increments, the percentage change measures would only indicate large changes during the *first* portion of the flap. Maintained elevated values of similar magnitude would represent no *relative* change and hence would not reflect the ongoing flap. Obviously, both absolute and percentage change measure must be used in concert.

A secondary disadvantage of this measure involves data samples with relatively small UFOR numbers, such as the FATE sample used in this analysis. If the sample number is very small, then integer shifts from 1 to 2 or from 2 to 4 would involve substantial percentage increases. Whereas a shift from 2000 to 4000 reports collected by the same researchers would in all likelihood not respond to recording artifacts, a shift from 2 to 4 in a small sample could reflect the nuances of selection. An error of one report, in these instances, could influence the measure by 50%. Most of the time, these measures have not been very useful for very small sample sizes such as the FATE series.

Optimal Increment of Space

Our previous work[2,5] indicated that spatial increments in the order of one degree longitude-latitude blocks are

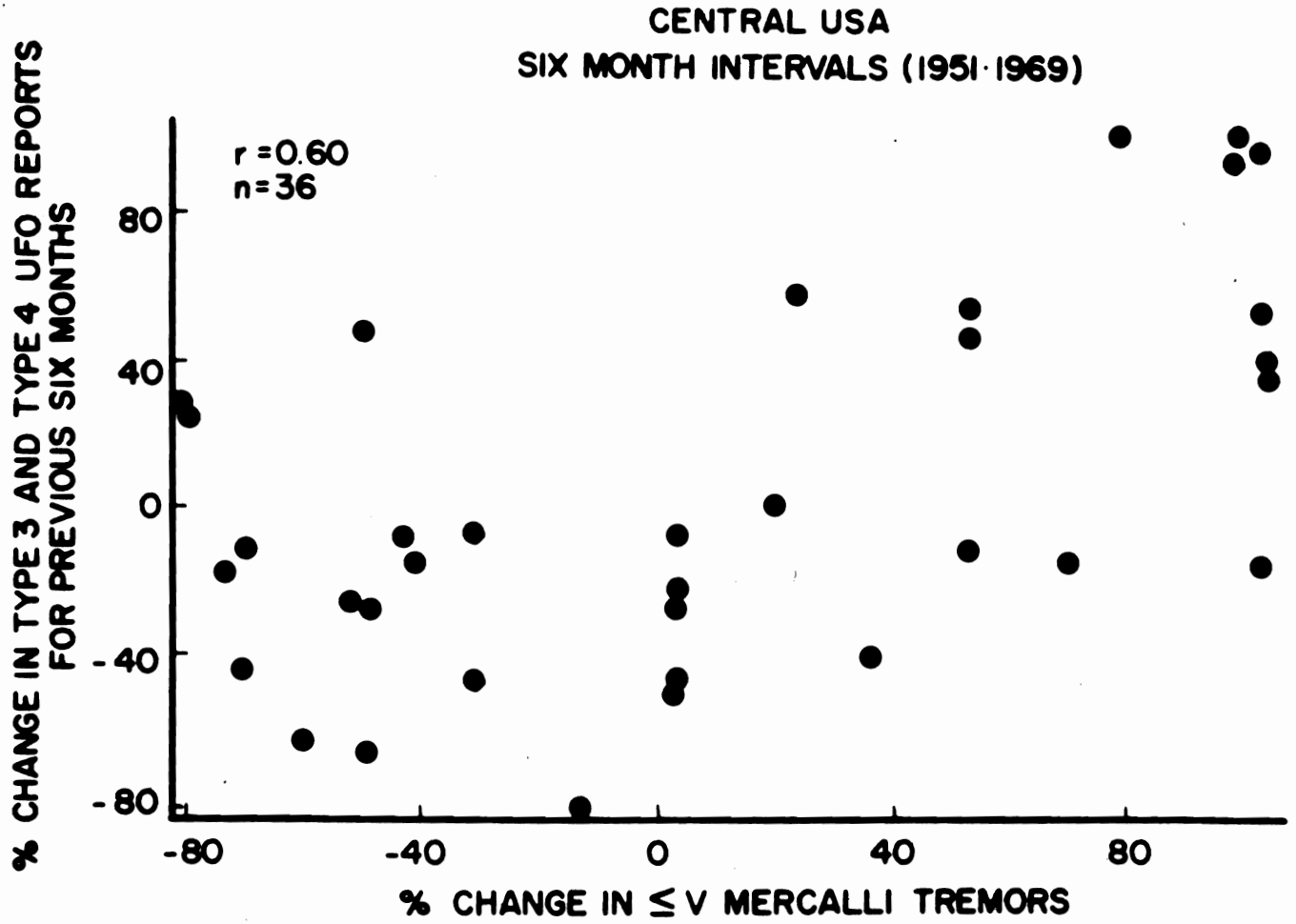

Figure 4. Scattergram of the percentage change in the numbers of V or less intensity earthquake numbers within the central U.S.A. and the percentage change in Type III and Type IV UFOCAT luminosities during the previous six-month periods.

minimal areas to discern the large-scale relationships between UFO reports and seismic activity. Even with this increment, there was significant spatial displacement, that is, the maximum relationship between UFO report numbers and seismic activity could occur within adjacent increments. Increments the size of the United States as a whole, were too large. They over-included areas with different seismic signatures and UFO patterns, producing an average that masked important individual differences within areas.

To determine "window size," UFORs were selected for the New Madrid states (Missouri, Arkansas, Illinois, Kentucky, Tennessee, and Indiana). The temporal increment of analyses for this part of the study was six months. Measures of UFORs within these areas for January to June and for July to December for these years were calculated by computer. Total number of intensity V (Modified Mercalli) earthquakes or intensity VI-VII, were also determined from Boulder, Colorado, data sources for these areas and this period.

The various UFOR measures for the CUFOs and FATE data were lagged ±2 increments from the contemporary interval by SPSS software. Detailed descriptions of symmetrical temporal lag analyses have been discussed earlier.[6] Such analyses allow quantitative comparisons of

(Continued on next page)

The six states surrounding the New Madrid seismic area (indicated within the ellipse).

UFORs during intervals (in this case, six-month increments) before, during or after the earthquakes. Symmetrical lag analyses can be used to test the tectonic strain hypothesis. If UFORs are associated with strain within the earth's crust, then the largest correlations should be evident in UFOR measures *before* increases in earthquake activity.

Table 1 contains the correlation coefficients for numbers of V or less intensity (MM) quakes and the various measures of UFORs during six-month increments before, during or after the seismic activity. Both the CUFOs and the FATE data are shown. In addition, the separate analyses for the years 1950-1965 and 1950 to 1970 are also presented. As mentioned previously, either a shift in data collection sources or sampling procedures (or both) may have occurred in the CUFOS data during the latter period.

TABLE 1

Lag correlation coefficients between absolute numbers of UFORs (ABUFO) or percentage change in UFORs (%UFOR) within the six states of the New Madrid region and absolute number of earthquakes (ABQU) or the percentage change in earthquakes (%QU) within the New Madrid area or this area plus the surrounding states. Two data samples, one from CUFOS and from FATE, are shown for two intervals (1952 to 1965 and 1952 to 1969).

	SIX STATES			SIX STATES + SURROUND		
LAG	ABUFO/ ABQU	%UFOR/ ABQU	%UFOR/ %QU	ABUFO/ ABQU	%UFOR/ ABQU	%UFOR/ %QU
			1952-1965 (28 cases)			
			CUFOS			
-2	-0.16	0.02	-0.00	-0.19	-0.06	-0.30
-1	0.36	0.13	0.08	0.75*	0.47*	0.47*
0	-0.04	-0.15	-0.15	-0.05	-0.33	-0.22
+1	-0.05	0.19	0.08	0.06	0.22	0.31
+2	-0.08	-0.07	-0.05	-0.31	-0.40	-0.45
			FATE			
-2	0.05	-0.19	-0.28	0.08	-0.17	-0.36
-1	0.41	0.28	0.26	0.58*	0.34	0.22
0	0.05	-0.16	-0.22	0.09	-0.17	-0.06
+1	0.04	0.10	0.04	0.04	-0.06	-0.05
+2	0.02	-0.04	-0.14	0.04	-0.04	0.01
			1952-1969 (36 cases)			
			CUFOS			
-2	-0.01	0.00	0.03	0.15	-0.11	-0.28
-1	-0.25	0.11	0.13	-0.23	0.39	0.39
0	-0.28	-0.19	-0.28	-0.22	-0.31	-0.31
+1	-0.19	0.19	0.35	-0.04	0.25	0.29
+2	-0.07	0.00	-0.41	-0.11	-0.29	-0.32
			FATE			
-2	-0.03	-0.21	-0.28	0.10	-0.15	-0.27
-1	0.40	0.25	0.25	0.55*	0.26	0.17
0	0.04	-0.17	-0.21	0.07	-0.14	-0.13
+1	0.04	0.09	-0.02	0.06	0.00	0.08
+2	0.04	-0.01	-0.12	-0.03	-0.00	-0.07

* $p < .01$

Three types of correlations between measures were used. The first correlation ABUFO/ABQU involved the total numbers of UFORs and the total number of V or less quakes. Total numbers are reported here since square root values for either the quake or UFOR measures did not significantly alter the magnitude of the coefficients. The second method (% UFOR/ABQU) was the correlation of the percentage change in UFO reports with the absolute numbers of earthquakes. This was done in order to determine any effects in the relative change in UFORs that could be tied to the absolute numbers (intensity of strain) of quakes (or the inferred total strain release). The final measure (% UFOR/% QU) involved correlations of the percentage change in UFORs with the percentage change in numbers of quakes.

Two levels of spatial analyses were used to determine the optimal space parameters. The left portion of Table 1 (under "Six States Only") contains coefficients for correlations between UFORs within the New Madrid states and the earthquakes within that area *only*. The right portion of the table ("Six States and Surround") shows the correlations between UFORs within the New Madrid states and earthquake numbers within this area *plus* the states surrounding it.

Several patterns are clearly evident. First, the highest positive correlations for the years 1952-1965 were (a two-year shift is required due to the nature of lag analyses) between earthquake numbers and the absolute numbers of UFORs during the previous six-month interval (lag = −1). In all other instances, the correlations between UFOR and earthquake numbers are either less or negative. This pattern confirms reports that UFORs proliferate during six-month intervals before increases in IV-V or less intensity earthquakes.[3]

The second pattern is the maintained relationship between earthquake activity and antecedent UFOR numbers within the FATE data sample. Correlation coefficients for the two intervals of analyses (1952-1965 and 1952 to 1970) did not change appreciably (+0.41 and +0.40, respectively, for the first spatial analysis; +0.58 and +0.55, respectively, for the second spatial analysis). The CUFOS results, however, demonstrated significant alterations when data after the year 1965 were entered. The highest correlations involved the percent change variables which tend to attenuate the effects of shifts in absolute numbers.

The third and most important result is the difference between the left and right portion of the table. Correlation coefficients between UFOR and seismic measures are significantly higher if the numbers of low intensity tremors from the areas surrounding the New Madrid states are included in the analysis. For example, in the CUFOS data, the correlation between earthquake measures within the six states and antecedent UFORs was only 0.36. When the UFORs from the previous six-month interval were correlated with earthquake numbers within the six states *plus* the surrounding states, the coefficient was elevated to +0.75.

These data indicate that a substantial portion of the variance in earthquake numbers required to explain UFORs may originate from outside the area. Both the FATE and CUFOS data demonstrated that earthquake activity in the surrounding states contributes to the variation in UFO report numbers within the New Madrid states. This difference was quite large. Without seismic data from the surrounding area only 12% rather than 50% of the variance in UFOR numbers was accommodated.

Extrapolation of these results to other spatial regions of the world would be premature at this time. Depending upon the characteristics of local geology, the interaction between near- and far-field stresses and the overall intensi-

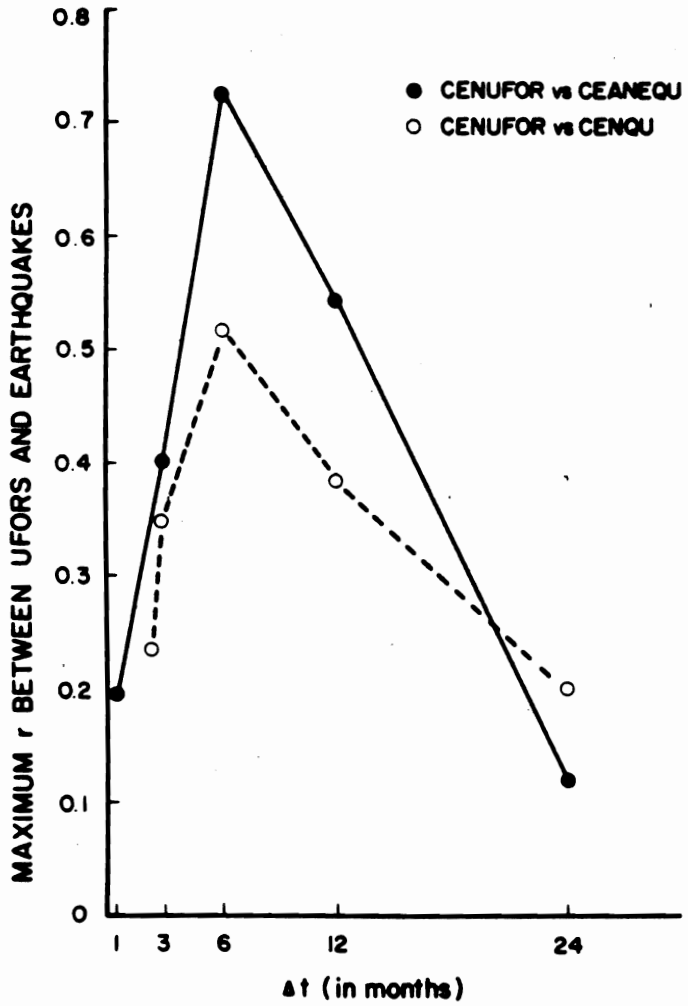

Figure 5. Maximum r (correlation coefficient) values between UFORs and earthquake numbers as a function of the temporal increment of analyses (in months) for UFORs within the central U.S.A. and earthquakes throughout the central and eastern portion of the U.S.A. (closed circles) and for UFORs within the central U.S.A. and quakes within that region only (open circles).

ty of the strain accumulation within crustal blocks, the "optimal" area could change quite dramatically. The critical feature for the UFO field researcher is that a significant portion of the strain involved with UFORs in his proximity may be manifested in strain displays (earthquakes) many hundreds of kilometers away.

Optimal Increment of Time

To determine, empirically, the optimal temporal increment, data from CUFOS for the years 1952 to 1965 from the central U.S.A. were used. They were sorted into the following temporal summaries: 1 month, 3 months, 6 months, 12 months, and 24 months. The one-month increment simply involved the totals of UFORs for each month during that period. Totals of UFORs for every two years, starting with 1950-1951, etc., determined the last increment.

Intensity V or less earthquake numbers for each of these temporal increments were determined for the area from which the UFORs were taken (the central U.S.A.) and for central, eastern, and northeastern (CEANE) sectors. The latter area was included in light of the analyses in the last section. One would expect that even at large areas, earthquake activity from adjacent areas could contribute to the UFORs within a region.

The results of both analyses are presented in Figure 5. Like the analyses reported in the previous section, the largest correlation coefficients occurred between UFORs and the earthquake numbers both within and around (in this case the eastern half) of the region. The bivariate relationship between UFORs and earthquake numbers within the central section are still statistically significant, although the magnitude is somewhat less.

Quite clearly, an optimal temporal increment of analysis exists within the CUFOS sample. Both spatial areas indicate that maximum intensity bivariate correlation coefficients occurred within temporal increments of about six months. Significant correlations between UFORs and earthquakes were still apparent for the 3-month and 1-year increments. Shorter or longer increments did not reveal the relationship.

The coefficients presented on the vertical (Y) axis of Figure 5 indicate the maximum r value of any increment within the ± 2-year symmetrical lag analyses. As one would expect, the actual lag value of the maximum r changes with the analysis increment. Whereas the 6-month increment analyses involved lag = −1, the 3-month increment analyses isolated lag = −2, that is, two 3-month increments before an increase in earthquake activity. The 1-month increment data demonstrated the maximum r at lag = −4, or 4 months before the change in earthquake activity.

If this pattern is consistent, analyses increments of larger than 6 months should not have demonstrated significant lag effects. Instead, the maximum r should have involved contemporary (no lag) intervals. This observation was clear with the 24-month increments and less evident with the 12-month procedure. In the latter case, both the contemporary and the previous (year) interval were comparable in r values. Since a 12-month increment could still be dominated by the 6 months before the quake measure while a 24-month increment would be weighted by three other intervals besides the antecedent one, this pattern is expected.

Yearly increments of analyses have produced very large relationships between UFORs and earthquake activity, particularly in FATE data. In several previous studies[6,7] correlations of greater than +0.80 have been noted between UFORs and V or less tremor numbers within the same year for the central U.S.A. and the New Madrid states for the years 1948 to 1974. It is possible that, like the optimal spatial increment, the appropriate temporal increment of analysis could vary in different places.

The major limit of the present analysis is the *fixed* time span. For example, in the 3-month increments, which involved total UFOR measures for January-March, April-June, July-September, and October-December for each year, the analysis window is not flexible. Implicitly these analyses assume that the temporal lag between UFORs and earthquake incidence does not change over the years.

It is quite possible that there is a "changing or oscillating latency," much like a "moving average" within the data train. Visual inspections of the data and extrapolations from the tectonic theory suggest this effect. Indeed,

one expects that from time to time, the rate of strain accumulation should change as far-field stresses dominate the tectonic region. Consequently, the optimal temporal lag between UFORs and tremors would change as well.

This relationship should not be confused with a change in the number of tremors. A marked increase or decrease in the number of V or less quakes would still be reflected systematically in the *number* of UFOR measures. However, if the number of tremors within a given increment is *also* correlated with a change in the rate of strain accumulation, then the UFOR-seismic relationship could be markedly attenuated with a fixed-interval analysis.

If the optimal latency between UFORs and seismic activity ranged between 2 months and 8 months over several decades, then 3- or 6-month analyses would consistently miss the total pattern. Sometimes the relationship would fall within the first lag while other times, it would fall within previous lags. Without taking the changing time-lag into consideration, it may be difficult to isolate the intricate dynamics required for prediction.

One example of this pattern was found within the 1-month increment data for the years 1951-1955 in the CUFOS data. For this period only, V or less MM quakes correlated between +0.40 and +0.60 with all UFOR measures during the previous four months! Scattergrams demonstrated an extraordinarily systematic relationship for this period. In consequent periods, the optimal lag was no longer fixed but seemed to vary between one and five months.

There may be still longer optimal increments, especially if very slow shifts in seismic baseline activity occur over decades. The data arrays for the central U.S.A. are too short for long-term analyses. However, time-series of earthquake activity in central Europe clearly indicates an 11- to 12-year and possibly a 20-year periodicity in the numbers of seismic events. UFORs would ride on this baseline as well. Most year-to-year UFOR fluctuations would reflect the immediate change in tectonic strain.

The absolute number of UFORs should crest during peak seismic decades. A conspicuous shift in the baseline of numbers of UFORs was obvious in Great Britain during the great seismic bursting between the years 1890 and 1896 and 1900 to 1914. A worldwide escalation of UFOs, sampled from sources in Europe, the U.S.A. and South America, reflected the unprecedented peak in worldwide seismic activity between the years 1905 and 1908. Such activity levels were not evident again on a worldwide basis, for either UFORs or seismic activity, until the year 1954!

Optimal Earthquake Intensities

Most luminosities, as measured by UFORs, should become more evident during periods of increased tectonic strain or changes in strain. As early as 1974, when *Space-Time Transients and Unusual Events* was being written, the clearest seismic-UFO relationship involved IV-V or less MM intensity quakes. Technical works published since then have emphasized such small-intensity quakes. In general, they are equivalent to approximate 2.0 to 3.0 magnitude events.

The tectonic strain model does not necessarily preclude other relationships. Since the critical factor is crustal strain, luminosities could also occur, theoretically at least, after earthquakes, if strain was still evident. From a strictly seismological perspective, this kind of strain could occur after single large or major events. The continuation of strain or the adjustment to strain within the area is frequently indicated by a protracted series of low-magnitude aftershocks.

Quantitative knowledge concerning the time between the UFORs and the intensities of the quakes is important for both prediction and determination of mechanism. If we assume that UFORs are associated with a specific intensity (or correlated type) of tectonic strain, then UFORs should occur whenever this level of strain is present within an optimal area of the earth's crust. Since significant correlations have been noted repeatedly between IV-V or less MM quakes and UFORs during the previous six-month period, the strain levels that preceded these quakes would be one candidate.

Normally, within a given area one would expect the luminosities to occur first and then, as the strain increases to fracture levels, the seismic activity is precipitated. In some instances, however, one would expect the strain to accumulate past the typical fracture levels and to continue to accumulate for some time. Since the optimal strain associated with UFORs would have occurred long before the ultimate large fracture, UFORs could occur years before intense quakes.

On the other hand, the optimal strain could occur after very large intensity quakes during periods of adjustment. A typical large quake for the central and eastern portion of the U.S.A. would be intensity VII or greater MM. The last instance of a VII occurred in Kentucky during 1980. If optimal strain did occur after large quakes, then UFORs should occur not before but *after*wards. Symmetrical lag analyses would demonstrate significant "positive" lags.

To test this hypothesis, symmetrical lag analyses were completed for the three UFOR measures and either V or less intensity quakes or VI or greater intensity quakes within the central U.S.A. and the central, eastern and northern (CEANE) U.S.A. The analyses were applied to both the CUFOS and FATE data samples for the two intervals (1952-1965; 1952-1970). Six-month analysis increments were used.

The results of the CUFOS analyses are shown in Table 2. Again, for the smaller quakes (V or less), the most significant effect occurs between earthquake numbers and the numbers of UFORs during the previous six-month period (lag = −1). This relationship is evident for all measures during the 1952-1965 period. The trend is even obvious within the longer period, particularly in the percent change evaluations, although the correlation coefficients are barely statistically significant.

UFOR measures do not appear to be systematically correlated with the numbers of VI or greater intensity quakes within the appropriate regions. The only significant correlation between UFOR measures and the larger intensity quakes occurred with percentage change measures in the central-northeastern region (CEANE) only. In this area, a significant percentage increase in UFORs occurred during the six-month increment *after* an increase in the number of VI or greater quakes. This relationship was not evident in the central region only.

Correlations within the FATE sample demonstrated a similar pattern. Low intensity (V or less) quakes were most correlated with total UFOR numbers during the previous

TABLE 2

Lag correlation coefficients between absolute numbers of UFORs (ABUFO) or percentage change in UFORs (%UFOR) and the absolute number of either V or less intensity or VI or greater intensity quakes (ABQU) or the percentage change in either (%QU) for CUFOS-recorded data for the central and the southeastern and northeastern sectors (CEANE) of the U.S.A. for two periods 1952 to 1965 and 1952 to 1969.

LAG	ABUFO/ABQU		%UFOR/ABQU		%UFOR/%QU	
	≤V	≥VI	≤V	≥VI	≤V	≥VI
			1952-1965			
			CEANE			
-2	-0.09	-0.20	-0.28	-0.33	-0.39	-0.39
-1	0.70*	0.13	0.49*	0.22	0.47*	0.34
0	-0.06	-0.07	-0.21	-0.13	-0.22	-0.20
+1	0.14	0.18	0.18	0.23	0.34	0.51*
+2	-0.13	-0.32	-0.40	-0.60*	-0.42	-0.57*
			CENTRAL			
-2	-0.05	0.05	-0.13	-0.11	-0.40	-0.40
-1	0.52*	-0.04	0.44	0.04	0.63*	0.02
0	0.00	0.14	-0.33	0.02	-0.38	0.13
+1	0.09	-0.12	0.10	0.01	0.43	-0.07
+2	0.27	0.00	-0.40	-0.13	-0.61*	-0.18
			1952-1969			
			CEANE			
-2	-0.24	-0.21	-0.23	-0.34	-0.40	-0.37
-1	0.15	0.06	0.41	0.19	0.30	0.21
0	-0.09	0.05	-0.19	-0.03	-0.16	-0.12
+1	-0.01	0.14	0.20	0.17	0.30	0.45*
+2	-0.20	-0.27	-0.32	-0.54*	-0.40	-0.54*
			CENTRAL			
-2	-0.23	0.00	-0.15	-0.22	-0.42	-0.11
-1	0.07	0.00	0.37	0.00	0.50*	-0.07
0	-0.11	0.16	-0.22	0.10	-0.21	0.15
+1	-0.08	0.11	0.06	0.01	0.25	0.00
+2	-0.15	0.06	-0.24	-0.19	-0.45	-0.24

* $p < .01$

TABLE 3

Lag correlation coefficients between absolute numbers of UFORs (ABUFO) or percentage change in UFORs (%UFOR) and the absolute number of either V or less intensity or VI or greater intensity quakes (ABQU) or the percentage change in either measure (%QU) for FATE-reported data from the central and the southeastern and northeastern sectors (CEANE) of the U.S.A.

LAG	ABUFO/ABQU		%UFOR/ABQU		%UFOR/%QU	
	≤V	≥VI	≤V	≥VI	≤V	≥VI
			1952-1965			
			CEANE			
-2	0.07	-0.01	-0.04	-0.06	-0.10	-0.03
-1	0.53*	0.10	0.07	0.00	-0.02	0.08
0	0.15	0.14	-0.14	-0.12	0.08	-0.20
+1	0.20	0.47*	-0.03	0.32	0.18	0.37
+2	-0.11	0.02	-0.34	-0.41	-0.38	-0.43
			CENTRAL			
-2	0.02	-0.06	0.08	-0.12	-0.05	-0.02
-1	0.35	0.01	0.01	0.09	0.40	0.00
0	0.02	0.12	-0.19	0.00	-0.37	0.24
+1	0.27	-0.13	0.15	0.16	0.34	-0.21
+2	-0.11	0.01	-0.36	0.07	-0.16	-0.15
			1952-1969			
			CEANE			
-2	0.09	-0.23	0.05	0.11	0.01	-0.11
-1	0.49*	0.11	0.07	0.04	-0.01	0.04
0	0.15	0.15	-0.08	-0.05	0.03	-0.13
+1	0.23	0.46*	-0.04	0.29	0.13	0.38
+2	-0.08	0.01	-0.25	-0.41	-0.27	-0.42
			CENTRAL			
-2	0.00	-0.03	-0.07	0.05	-0.11	0.09
-1	0.33	-0.06	0.19	0.08	0.34	-0.02
0	0.05	-0.12	0.07	0.04	-0.26	0.24
+1	0.28	-0.11	0.14	-0.07	0.30	-0.09
+2	0.05	-0.04	-0.31	0.00	-0.32	-0.20

* $p < .01$

six-month interval. Again, unlike the CUFOS data sample, the tendency for UFOR numbers to increase during the six-month interval before an increase in intensity V or less quakes was evident for both intervals of analysis.

A similar but weaker effect was also noted for larger quakes in the FATE sample. As can be seen in Table 3, the most significant correlations in the CEANE region of the U.S.A. occurred between the numbers of VI or greater quakes and the numbers of UFORs during the following six-month interval. It is also apparent somewhat in the percentage change measures. Like the CUFOS sample, the FATE sample did not indicate any significant quake correlations between UFORs and VI or greater quakes within the central section only.

Although positive correlations are important demonstrations of the tectonic strain theory, large negative correlations are important as well. Within both the CUFOS and FATE samples, several measures showed systematic negative correlations between VI or greater quakes and UFORs two increments later. Stated in an alternative manner, an increase in VI or greater quakes is associated with a very significant percentage decrease in UFORs compared to the previous interval.

The critical feature here is the percentage change with respect to the previous increment. In these instances, there would be a relative decrease in UFORs about one year after VI or greater quakes. Note, however, that the absolute numbers of UFORs may still be quite elevated, even maintained at flap or near-flap levels. However, the *relative* number of UFORs would decrease.

This pattern should not be ignored because of its apparent complexity. Since some of the largest negative *and* positive correlations for both the small and large quakes occur with the percentage change measures, there is a strong possibility that a significant portion of UFORs are coupled to some tectonic processes associated with *change* in strain parameters.

The absence of significant correlations between UFORs and large quakes is not conclusive since only two lag increments (one year) were used. UFOR numbers may increase several years before the incidence of the larger quakes within the central U.S.A. Previous reports, based upon FATE data for the New Madrid section only, indicated that UFORs increased one to three years before increased large-intensity quakes.[6]

Fort's data for Great Britain during the years 1850 to 1910 also indicate a "quake intensity-dependence" for the optimal lag in UFORs. Whereas normal seismic activity was associated with "luminosities" within the same year, peak numbers of luminosities were reported one to two years before above-average seismic intensities. In the two instances of extraordinary seismic events in Great Britain;

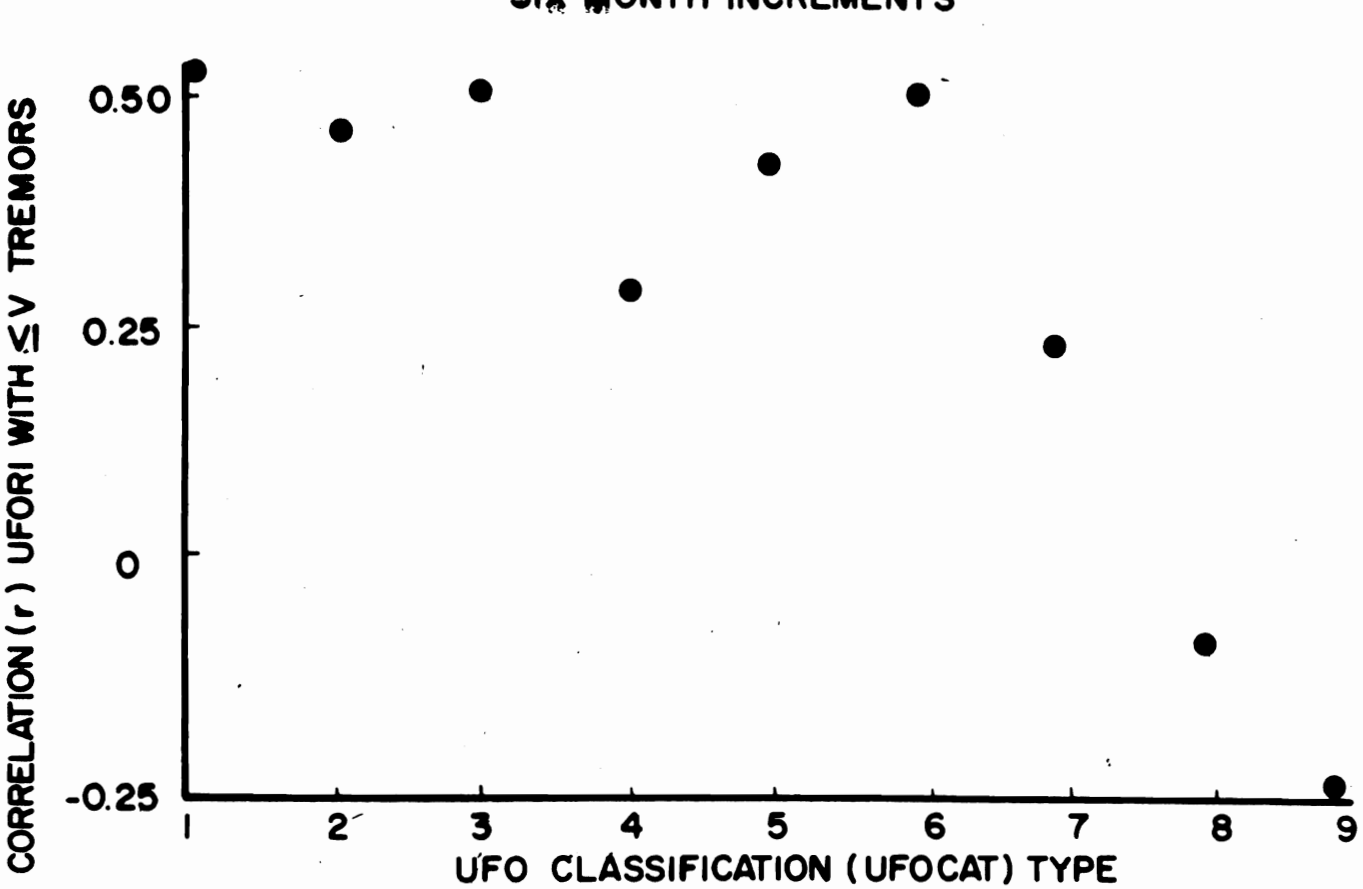

Figure 6. Maximum correlation (r) coefficients between numbers of V or less intensity tremors and numbers of UFORs for the different UFOCAT classification types, using six-month increments of analysis. The UFOCAT classification increases from least to greatest "strangeness" of the report.

UFOR activity began to increase *three* years before the major shock.

Determining Optimal Types of UFO Reports

One of the first conclusions obvious to the experienced UFO researcher is that all reports do not share the same properties. Most professional organizations recognize case differences as indicated by their uses of UFOR categories. For example, Hynek's now-famous triad involves close encounters of the first, second and third kind.

Objective and consistent differentiation of UFORs are critical procedures. Except for the unusual nature of UFO reports, there is no reason, a priori, to assume that all UFO reports originate from the same source of variance. We may be looking at quite different phenomena, each with a different mechanism. If this assumption is true, then any attempt to explain all UFO reports by a single theory (as opposed to an empty or non-testable explanation) must fail.

Overinclusion of many fundamentally different phenomena within the same arbitrary rubric has been a repeated impedence in the history of science. At one time, the diseases we now call pneumonia, influenza, cancer and emphysema were all placed, on the basis of superficial similarity, under the label "vapors."

One can imagine what would have happened if penicillin had been discovered during this period. Since this drug would optimally treat only the cases we now call pneumonia and not all the cases called "vapors," the efficacy of the drug would probably have been gravely underestimated. In fact, penicillin most likely would have been dismissed on the basis that it treated only "some" cases of vapors.

A similar problem may exist within UFOR label systems. Both statistical and experimental analyses indicate that some UFO reports are heavily loaded by natural processes associated with tectonic strain while others are influenced primarily by social conditions, personality variables, and even transient brain dysfunction. We must realize, of course, that in a statistical universe, there may even be some cases that are beyond our *present* methods of understanding. In fact, some UFORs may be unique; the events may happen only once.

Frankly, I do not expect the tectonic strain theory to explain *all* valid UFO reports. Analyses to date indicate that this theory can accommodate at least 50% but not more than about 75% of classic UFO cases. This asymptote may reflect the limit of the model itself or it may reflect the data sample. Most of the empirical tests for the theory have involved total UFO reports, that is, the summary of all classifications from either the CUFOS or FATE samples.

To test the relative relationship between different types of UFORs and optimal seismic parameters, separate analyses were completed for the nine types of UFORs according to the Saunders classification (CUFOS). The central theme for this classification is increasing

"strangeness" of the phenomena. Whereas Type I and II UFORs involve lights in the sky that could relate to ordinary meteoric or astronomical events. Types III and IV describe luminous events with multiple non-linear trajectories.

Type V or greater events include reports of UFOs moving within the observer's frame of reference. They include Hynek's encounter cases, Vallee's Type I classification and Keel's low level events. While Type VI reports involve "landing" descriptions and Type VII reports involve the observation of occupants outside of the object, Type VIII and IX reports require more bizarre information. Communication with beings or long-term physical changes in the observer are two criteria.

Figure 6 displays the final analyses of the maximum correlation values (with lag = -1) between the different types of CUFOS classifications and consequent seismic activity. The analyses involved six-month increments during the 1950 to 1965 period. As can be seen clearly, all of the major types of UFOR classes were significantly correlated with consequent increases in V or less intensity earth tremors. Even Type V and VI classifications, where the UFO enters the observer's frame of reference, were significantly correlated with the seismic events.

The most conspicuous deviation from this relationship involved the Type VIII and IX cases. Coefficient values for these cases are not statistically significant and negative. Because of the smaller numbers of cases within types of UFO reports as the strangeness increases, *partial correlation* analyses were completed with UFOR type, numbers of reports and seismic activity. The correlations between quake numbers and UFORs were not artifacts of simple differences in the number of reports. When the variances due to difference in numbers of UFORs in the various categories were held constant, the correlations between UFORs and seismic activity were not affected.

These results indicate that components of most UFOR categories could be accommodated by the tectonic strain theory. The failure of any significant portion of the two strangest types of UFOR classes to be correlated with earthquake numbers suggests that they may be associated with other sources of variance not related to tectonic strain. At this time, no variables have been isolated empirically that could accommodate the variance in these types of reports.

One cautionary statement is in order. Even though most categories of UFORs were correlated with V or less quakes, the r values indicate that between only 10% to 30% of the variance in these reports can be accommodated by knowing the consequent seismic pattern. This may indicate that a significant portion of the UFOR variance for all types of classifications may still involve non-seismic factors.

General Discussion

Several important results have emerged from this study. First, different data pools collected by different agencies confirm the variation in reports of UFOs during similar periods. Both data samples also confirm the correlation between these reports and the later occurrence of certain intensity earthquakes. Secondly, different types of UFORs were correlated with specific earthquake activity, thus suggesting a central process for which different labels have been given. Only the strangest of UFO types did not correlate with seismic measures.

The third result involves the isolation of at least one optimal space-time frame. Although three levels of spatial analysis and five different time frames were used, the relationship between UFORs and seismic activity was strongest at particular values. UFORs within the six states adjacent to the New Madrid region, for example, were best explained when seismic activity from the surrounding states was included as well. This pattern was seen primarily with a six-month increment of analyses.

These parameters have several important implications for UFO research. Existence of a phenomenon at this level of space and duration strongly suggests the operation of a geophysical process. Primary involvement of meteorological variables (which vary in the order of several days) seems unlikely. Long-term sources of variance, such as solar variations or correlative geomagnetic factors, cannot be eliminated.

Although large-space, six-month time-frames may be routine geophysical parameters, they are far beyond the limits of human perception. Human beings, including UFO researchers, exist within time-frames of a few days and spatial boundaries of a few hundred square kilometers. We expect to see things happen quickly, within a week or so, not slowly undulate over tens or hundreds of weeks.

Human observation of a phenomenon that exists within a temporal window of several months to a year is like the measurement of the millisecond actional potential measured in picosecond intervals. There are just too many increments to clearly see the phenomenon. Because of the large time required to see the whole, we experience sensory overload. We are left with a long series of apparently empty bins of time; often there is a compulsion to fill those bins with irrelevant information.

The tectonic theory can predict accurately when UFORs will occur within a particular space. Although the operations are complicated, they are not beyond the skills of the dedicated scientist who has access to computer software. However, because the phenomenon exists at a level of months, the predictions must occur within this period. The most conservative interpretation of this statement is that prediction to the nearest week may be beyond the limits of the data or the model, or both.

Other sciences are faced with comparable problems. At the level of decades or centuries, seismologists can predict earthquakes with great precision. Within the increments of years, behavioral scientists can predict, with great accuracy, the occurrence of psychological crises. Using daily windows, meteorologists can forecast the weather.

Only when the technicians of science go beyond the limit of the phenomenon being studied do the problems arise. When the seismologist attempts to use models molded from increments of decades to predict the occurrence of the next earthquake to the nearest day, he fails. When the meteorologist attempts to predict weather four months from now, to the day, the accuracy degenerates to noise. When the behavioral scientist attempts to determine when you will have a personality crisis to the nearest minute, the error is humiliating.

One solution to this dilemma is to expand secondary and tertiary components of the equation. Although the fundamental phenomenon may be controlled by long-duration sources, finer prediction could be made by introducing more transient factors. The latter would ride

upon the slow-moving baseline of the former like small wavelets upon the deeper body of water. These variables would be considered "trigger variables," that is, events that precipitate the phenomenon, given the primary condition is present.

The data patterns clearly indicate that the occurrence of UFORs within increments of six months are influenced by the imminent tectonic strain within the area. However, there should be other variables, trigger stimuli, that could allow the UFO scientist to narrow the temporal increment of prediction even further. By adding these variables to the equations, finer resolution, perhaps to the nearest week, could be accomplished.

Probable trigger events appear to be the passage of an air mass or the occurrence of a geomagnetic storm. Interestingly, several unpublished accounts suggest that intense and well-documented luminosities (in the U.S.A.) are associated almost invariably with excessive perturbations in the ionosphere on the day of the observation. Usually these perturbations appeared to be correlated, often with lag times from hours to days, with geomagnetic storms triggered by solar flares.

When the UFORs from Fort's data or from contemporary sources are printed as daily data streams, which are extraordinarily difficult to perceive as a unit (especially over several decades), a general, geomagnetic connection is clear. UFOR flaps are associated predominantly with sudden increases in geomagnetic disturbances within the previous week or so. The converse does not hold. All geomagnetic disturbances are not associated with UFORs.

However, this is exactly the kind of relationship that one would expect from the tectonic strain model. UFORs could be triggered by a process associated with a recent geomagnetic perturbation, but only if the precondition—the tectonic strain—existed during the time. If the strain conditions were not optimal, then no amount of geomagnetic stimulation would precipitate the occurrence of the processes leading to the UFOR.

Consequently, the close temporal contiguity between an unusually large solar flare and geomagnetic storm (A_p indices greater than 50) or especially a sudden, large increase (e.g., A_p indices greater than 100 have been noted in the UFO literature). The 1967 and 1972 flaps followed unusually intense geomagnetic disturbances. During these years, the UFORs occurred in areas that later demonstrated an increase in seismic activity, thus indicating the existence of strain within the region at the time of the UFORs.

The pattern can be seen outside the U.S.A. as well. For example, the bout of UFORs reported in Great Britain (particularly the St. Brides Bay region) between 1974 and 1977 were most likely linked to the tremor swarm near Stoke-on-Trent during 1975 and the (infrequent) VII intensity quake near Chester, England on July 8, 1980. (Although higher-intensity quakes are unusual in Great Britain today, they were more frequent, as were major clusters of UFORs, during the collection period of Charles Fort.)

Since the land mass of Great Britain is relatively small compared to the areas in the U.S.A. that are required to elucidate the maximum relationship between numbers of UFORs and earthquakes, the tectonic strain model would predict that earthquake activity outside the major flap region should have contributed to the observations. Indeed, on December 26, 1979 an extraordinarily rare 4.5 R quake rocked Glasgow, Scotland. A quake of this intensity had not occurred in this area for about 200 years.

Slow tectonic strain accumulation and consequent low-level earthquake activity (such as the V or less Modified Mercalli quakes in the U.S.A. and the tremor swarm from Stoke-on-Trent) are associated with the classic 1- to 10-day bursts of flap reports superimposed upon an elevated baseline of UFORs that lasts for several months to years. If the strain continues and a large, rare quake is imminent, the more energetic and bizarre UFO-related reports should begin to proliferate. Interestingly, the Rob Taylor case occurred on November 9, 1979, less than two months before the Glasgow seismic event and within 50 kilometers of the epicenter.

In the Soviet Union, the recent UFOR flaps between February and early March, 1982 were clearly associated with intense geomagnetic storms on the day or days shortly before the displays. These UFORs have been particularly energetic episodes, suggesting that strain is still building within the area. This recent epoch of UFORs appears to have begun in May, 1981, during which time, allegedly, thousands of witnesses observed luminosities over major cities in the U.S.S.R. According to the tectonic strain model, this unusually bright event would have been the prodome to the VIII intensity (5.0 R) quake that vibrated the general area on November 13, 1981.

Certainly, a major breakthrough in the application of the tectonic strain model to the UFO problem would require the discovery of some simple measure that *directly* monitors strain within local and larger areas. Such a measurement may require a matrix of instruments strategically placed over a large region or perhaps a special adaptation of satellite reconnaissance. Tectonic strain-related shifts in *patterns* of spectral absorption lines from large composite areas are a possibility. The precise technology is not evident at this time.

The tectonic strain theory accommodates all of the major characteristics of UFO phenomena. There are, however, many other patterns hidden within the complex field of Fortean data. *UFOs or odd luminosities are only a more tractable segment of this continuum.* Precise elucidation of the controlling variables of UFO phenomena should not detract from the mystery of Fortean events. Indeed, it increases the appeal even more. For now we know there is an empirical handle by which we can open the door to even more profound discoveries.

Within the framework of the tectonic strain model, Dr. Brian Brady (personal communication) and his colleagues at the Department of the Interior (Bureau of Mines) have isolated a phenomenon that appears to be a fundamentally unknown physical condition. Just before fracture of rock samples, small luminosities are emitted that demonstrate spin, ejection of plasma-like material, and alterations in radio frequency emission. The calculated magnetic field strength of this neutron star-like condition achieves intensities that could influence automobile engines and electrical systems. Energy flux, if the luminosity were sufficiently large, could carbonize life forms or burn holes through the entire organism.

There are many other questions to be answered. What is the connection source for the time-lagged relationship between UFORs and poltergeist reports? Why should unusual weather conditions and meteorological extremes

precede bursts in UFORs? Is the traditional sequence of climatic alterations, Fortean displays and large earthquake occurrences related to some central source? Do UFORs accommodate the variance in the political and religious paranoia that accompany flaps, or are both controlled by a third variable? Are rock falls or the continued stream of moisture within the same space, indices of some fundamental process hidden within their temporal infrequency?

Although the answers are unknown at this time, the methodology to find them is clear. Quantification of the data and the application of appropriate, contemporary, analytical methods are essential. These problems can only be answered by the competent usage of multivariate methods such as discriminative, multiple regression, and perhaps even canonical analyses. With these techniques, one can determine the variables that discriminate periods of rock falls, obtain the equations that predict UFORs on the basis of seismic-geomagnetic data, or isolate the functions upon which different Fortean variables and environmental events cluster.

The computer hardware is available; the software can be obtained. Any young Fortean scientist with a proficient understanding of numerical analyses and the capability to grasp the concept of changing temporal increments and spatial windows, could contribute immensely to the understanding of these phenomena. The recondite patterns are there, waiting.

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